Living with Wind Turbines

Chartered Institute of Environmental Health

Living with Wind Turbines

An investigation into public perceptions and experiences of affected communities

June 2012

University of ULSTER

Acknowledgments

Thanks to the NIEA Challenge Fund which provided the financing to carry out the survey fieldwork which informed this report. Thanks also to the fieldworkers who carried out the door to door survey at the 2 sites. Most of all, thanks are due to those residents within the communities who participated in the research, without which this publication would not be possible.

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1. Executive Summary

In this coming decade the Northern Ireland Executive aims to maximise the amount of electricity generated from renewable sources in order to enhance the diversity and security of energy supply, reduce carbon emissions and contribute to the province's 40% renewable energy electricity target by 2020.

In view of this target, it is essential to consider the impacts of renewable methods of electricity generation in Northern Ireland (NI) and the level of acceptance of this infrastructure by communities where the technology is located. Northern Ireland is positioned in one of the best locations in Europe, and indeed the planet, to exploit wind energy, however at the neighbourhood level wind farms have anecdotally often been viewed less than favourably by the communities in which they are situated.

In relation to assessing community views on wind energy generation, the research carried out in this study focuses on the perceptions of environmental quality by the residents of two neighbourhoods, one situated within 3km of an operational wind farm site and the other situated within 3 km of a proposed wind farm site.

The research findings indicate that the presence of wind turbines had little impact on the resident's perception of their neighbourhood as both sites rated their area as 'good' or 'very good'.

At the operational site respondents within 3km of the wind farm reported, in an average of 85.6% of cases, that they were not affected at all by the wind farm, in relation to the issues of main concern, visual impact, damage to the environment and negative impact on property prices.

This study found that respondents were generally strongly in favour of energy generation by renewable technologies, including wind power with support being stronger at the site that is operational rather than the proposed wind farm site. The majority of respondents from both areas also considered wind turbines to be an effective method of generating electricity.

Respondents from the operational site were more likely to find wind turbines pleasant to look at compared to those at the proposed site. The findings suggest that the experience of living in close proximity to operational wind farms has largely reduced or mitigated previous perceptions and/or concerns.

The issue of securing tangible benefits for the local community needs to

1. Executive Summary

be addressed. Very few respondents from the operational site feel there has been much benefit at all to the community as a whole. In relation to this the creation of community turbines should be investigated, as has been done in Wales, where the host community benefits from wind energy installations and local people can exercise a degree of control over the projects.

1.1 Project Aim

To compare the public perception, concerns about and experiences of wind farms and other methods of electricity generation among populations who reside close to a proposed wind farm site (Site 1) and those who reside close to an operational wind farm site (Site 2).

1.2 Objectives

1.2.1
To determine how individuals rate their local area as a place to live and investigate any relationship between these views and their opinions on electricity generation and wind turbines.

1.2.2
To establish the public perception of local wind farms and methods of electricity generation in general, at both sites, pre and post development.

1.2.3
To ascertain if the population at the proposed site (Site 1) have a generally positive or negative perception of the planned wind farm and establish what, if any, their main concerns are in relation to the planned wind farm.

1.2.4
Determine if the local population at the operational site (Site 2) perceive the wind farm to have had either positive or negative impacts on the community and surrounding environs and investigate any change in opinion between pre construction and post construction phases of the wind farm development.

To determine if the local population in both areas consider themselves to be well enough informed about existing or planned wind farms.

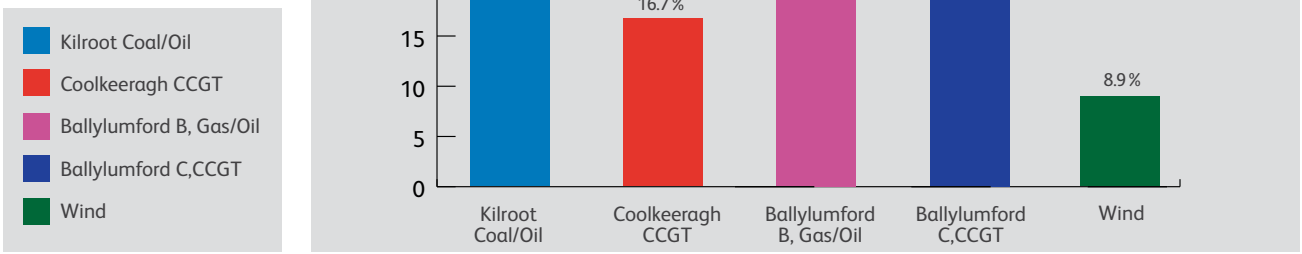
2. Introduction and Policy Background

Changing the methods of electricity generation and moving away from a reliance on imported fossil fuels gives NI the opportunity to become more energy independent, as well as contributing to the Northern Ireland economy and reducing carbon emissions. Increasing energy security within the province is a compelling goal for a number of reasons. The ability to meet our electricity needs from locally generated resources reduces the risk of energy supplies being interrupted because of political or social unrest in other countries. In addition, improved energy security also potentially provides a degree of price stability that can impact positively on levels of fuel poverty.

In the Digest of UK Energy Statistics (DUKE) 2011, it is reported that the UK was a net importer of energy in 2010 and that 80% of energy production in the UK was accounted for by oil and gas. The situation in N. Ireland in 2010 was even more extreme with over 90% of electricity generation being derived from imported fossil fuels.

Graph 1

N. Ireland electricity generation percentage by Fuel Source, May 2010
Data source: Department of Energy and Climate Change

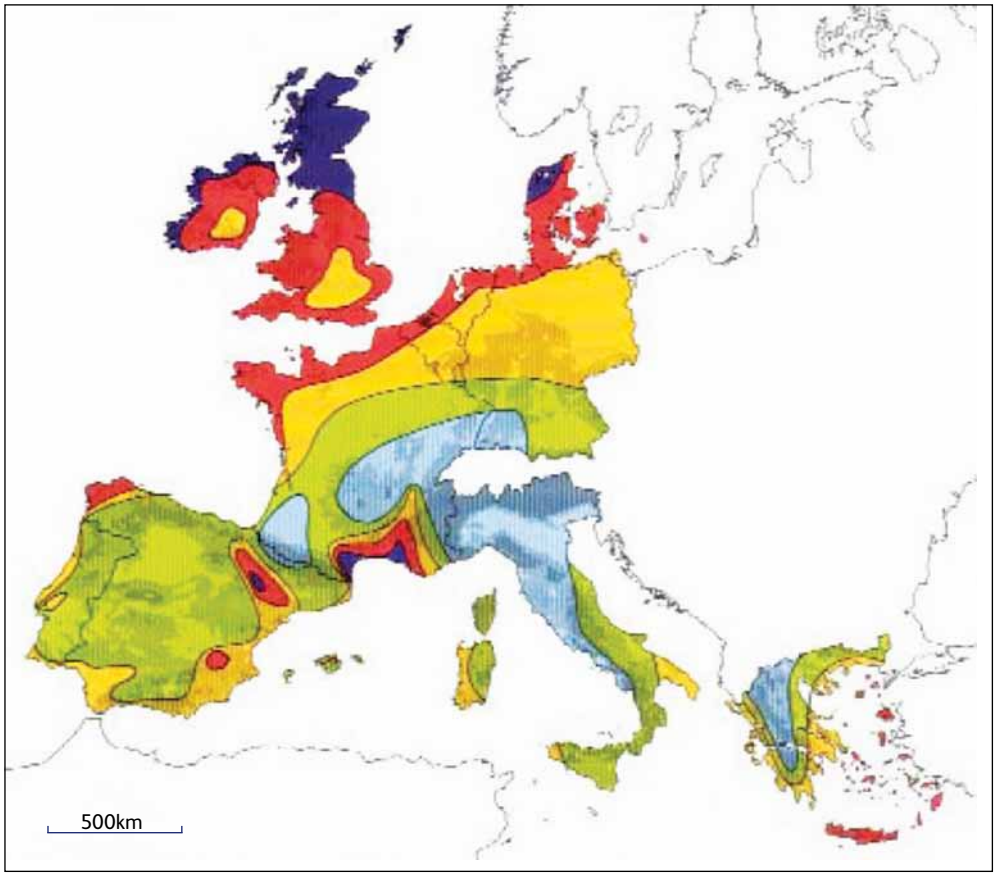


Northern Irelands' westerly location within the British Isles immediately adjacent to the north Atlantic, places it at an advantage in relation to the amount of wind resource available. As is illustrated in the map opposite it is ideally located to exploit some of the best wind resources within the European Union.

A shift to renewable energy for electricity generation will also contribute significantly towards reducing NI's greenhouse gas emissions. While renewable technology is to be supported, care must also be taken that the lives of those who reside close to such installations are not negatively impacted upon and that the surrounding environment is also protected.

2. Introduction and Policy Background

2.1 Strategy and Policy Background – NI and UK



European Wind Atlas, Onshore, 1989

	Wind resources[1] at 50 metres above ground level for five different topographic conditions									
	Sheltered terrain[1] ms $^{-1}$	Wm $^{-2}$	Open plain[3] ms $^{-1}$	Wm $^{-2}$	At a sea coast[4] ms $^{-1}$	Wm $^{-2}$	Open sea[5] ms $^{-1}$	Wm $^{-2}$	Hills and ridges[6] ms $^{-1}$	Wm $^{-2}$
	> 6.0	> 250	> 7.5	> 500	> 8.5	> 700	> 9.0	> 800	> 11.5	> 1800
	5.0 – 6.0	150 – 250	6.5 – 7.5	300 – 500	7.0 – 8.5	400 – 700	8.0 – 9.0	600 – 800	10.0 – 11.5	1200 – 1800
	4.5 – 5.0	100 – 150	5.5 – 6.5	200 – 300	6.0 – 7.0	250 – 400	7.0 – 8.0	400 – 600	8.5 – 10.0	700 – 1200
	3.5 – 4.5	50 – 100	4.5 – 5.5	100 – 200	5.0 – 6.0	150 – 250	5.5 – 7.0	200 – 400	7.0 – 8.5	400 – 700
	> 3.5	> 50	> 4.5	> 100	> 5.0	> 150	> 5.5	> 200	> 7.0	> 400

Northern Ireland has a variety of both legal and policy obligations to help reduce carbon emissions through the use of renewable energy:

Promotion of renewable energy in NI is embedded in both national and international policy - Northern Ireland's Regional Development Strategy 2025, Sustainable Development Strategy 2010 and numerous energy policies, such as the UK Renewable Energy Strategy 2009 and the Northern Ireland Strategic Energy Framework 2010.

The European Renewable Energy Directive 2009/28/EC legally requires a National Renewable Energy Action Plan for the UK, which has resulted in the UK wide target of 15% of electricity generated from renewable sources by 2020.

2. Introduction and Policy Background

Current targets set by the Minister for the Department of Enterprise, Trade and Investment (DETI) in the Strategic Energy Framework NI 2010 aim to produce 40% of electricity via renewable methods by 2020.

In the Strategic Energy Framework 2010 for NI it is stated that 40% of electricity generated from renewable sources by 2020 is thought to be an attainable target.

The Draft Programme for Government (2011-2015) published by the Northern Ireland Executive in late 2011 states that it intends to encourage the production of energy from renewable resources to reach 20% by 2015.

The Northern Ireland Renewables Obligation was introduced in 2005 and requires that electricity suppliers can account for proportions of their electricity generation having come from renewable resources.

The proposed targets and strategies gave rise to Planning Policy Statement 18 2009 (PPS18; DOE, 2009) which sets out planning policy within the Department of Environment for renewable energy installations.

PPS18 deals with planning policy surrounding Renewable Energy technologies and their installations. PPS18's objectives are to ensure that 'environmental, landscape, visual and amenity impacts' are considered and addressed, and where there is an unacceptable impact, then the planning application for the installation would be denied. The document recognises that large scale wind operations are likely to have some impacts, and are often sited in areas which are aesthetically pleasing or environmentally sensitive and also sets out the minimum distance of 500m OR 10 times the rotor diameter which a wind turbine is permitted to be to an occupied property.

NI has set a 652% growth rate in renewable energy generation between 2003 and 2010 with the vast majority being from wind power (Energy Trends, DECC, Sept 2011).



2. Introduction and Policy Background

2.2 Potential Health Impacts of Wind Turbines

In 'Health Effects and Wind Turbines: A Review of the Literature', 2011, Knopper et al concluded that there are no peer reviewed studies that show a direct causal link between wind turbines and the negative experiences of those living close to them. It was found in the study that, where negative health effects had been reported, they were as a result of the stressed condition induced in some of those living near wind farms.

This conclusion is supported in a report by the Chief Medical Officer of Health for Ontario, Canada, on the health effects of wind turbines, published in 2010. That report also notes that sound levels from wind turbines are insufficient to affect hearing. Annex1 of PPS18, suggests that the indicative noise level of a wind farm at 350m distance from a typical dwellling is 35-45 dB(A). Guidelines of night time noise levels released by the World Health Organisation indicate that levels should not exceed 40dB outside a dwelling in order to prevent sleep disturbance and preserve health.

Research into the health effects of shadow flicker – which happens when an observer is in a position where they can see the blades of a turbine pass in front of the sun, resulting in an intermittent shadow, was undertaken for a report prepared for the Massachusetts Department of Environmental Protection and Department of Public Health in 2012. The reported, compiled by an independent expert panel said that there was no scientific evidence that shadow flicker was enough to cause seizures. The panel did, however, recognise that shadow flicker 'can be a significant annoyance or nuisance to some individuals'. The degree of flicker which a nearby resident would be exposed to varies depending on the time of year, the time of day and the resident's location.

2.3 Environmental Effects of Wind Turbines

The visual impact of wind turbines on the landscape is especially relevant where the surrounding environment is rural, scenic or sensitive in nature. Abbasi et al, 2000, indicate that, although wind power has relatively few effects compared to other electricity generation sources, aesthetic degradation, noise pollution, stressed ecosystems and an increase in soil moisture may be evident in sensitive areas. Abbasi et al, 2000, also points out that the tower structure and the rotor blades of wind turbines can cause electromagnetic interference and can potentially 'chop TV signals to an irritating degree'.

Environmental effects also includes disturbance to flora and fauna. There has been concern for the potential of birds to fly into the rotating blades of a turbine; however bird fatalities equal 1-2 birds per turbine per year, on average (Taylor D, 2004). It is noted that there may be some effects on nesting grounds and migratory patterns of some birds (Shepherd et al, 2011), but these impacts are deemed to be negligible.

2.4. Public Perception of Wind Farms

In the publication 'Public Attitudes to Wind farms; A Survey of Local Residents in Scotland' published in 2003, Braunholtz et al surveyed 1,810 people by telephone interviewing those who lived within 20km of a wind farm. It was found that, on average, 20% of people reported the wind farms having a positive impact on the area, 73% had no opinion and 7% felt there was a negative impact. A higher proportion of those living closer to the wind farms considered them to have a positive impact on the area (44%) as opposed to those living farther away (16%).

2. Introduction and Policy Background

The most common issue that residents reported feeling concerned about before the wind farms were erected was the visual impact on the surrounding landscape. Traffic and noise during construction were also reported as concerns although actual disturbance was found to be low. Braunholtz also found that overall people liked their area and only five people spontaneously mentioned wind farms as something they disliked about their area. Those who saw wind farms on a daily basis regarded them more favourably. It was also found that the majority of respondents were in favour of reducing the use of nuclear power, coal and oil, while increasing the use of wave and wind power. Regarding the actual pre construction consultation and planning process, Braunholtz found that most people did not remember being consulted about the wind farm, and that the local newspaper was the largest source of information at the time (40%) with 11% being dissatisfied at the consultation.

In another study 'Green on Green: Public Perceptions of Wind Power in Scotland and Ireland' published in 2005, Warren et al surveyed 355 residents in Scotland and Ireland via face to face interviews. They also found evidence that those living closest to the wind farms had an increased positive opinion of them as well as finding that effects on the visual impact of the landscape was a major influence on a person's support of wind power projects. In terms of sites in Ireland, there was a 42% increase in positive opinion amongst those living close to sites, as opposed to 26% farther away.

Warren et al also noted that residents' concerns expressed prior to the construction of the wind farm were not realised. With regards to noise, 11% of people residing close to the wind farms reported that they could hear them, but 75% of that number did not object to hearing the noise. In Warren et al's paper, opinions from both an operational and a proposed wind farm site are compared and the issue of NIMBY-ism ('Not In My Back Yard') is investigated. It was found that NIMBY attitudes existed in a more pronounced way at proposed sites as opposed to at operational sites. Indeed, Warren et al stated that there was a 'reverse NIMBY' attitude at operational wind farm sites. They found that those who were the most accepting and supporting of the wind turbines were those who were living close to sites and as a general trend, support for local wind farms is either lower or neutral at the proposed site compared to the operational site.

In this investigation two populations were chosen to assess the views of those living close to both operational and proposed wind farm sites. A wind farm site currently seeking planning permission with a relatively near-by recently commissioned operational wind farm was chosen to ensure that both populations would be from very similar settings for example, the rural environment, education, distances to urban areas, size of settlement etc.

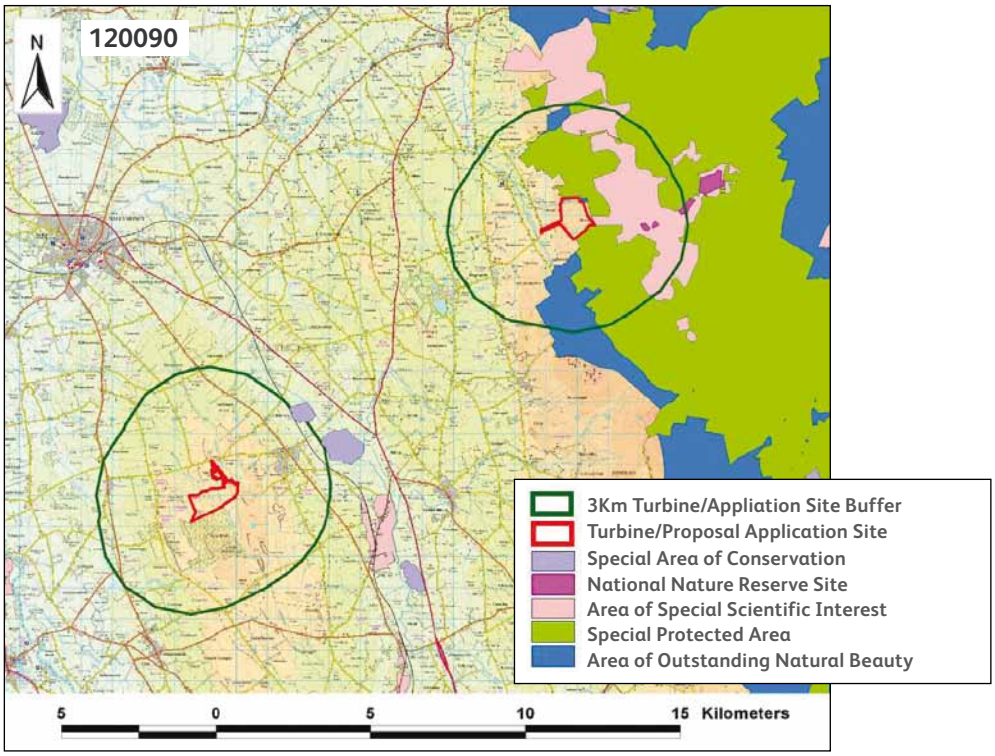


3.0 Methodology

3.1 The Study Areas

The operational and proposed sites chosen were both rural in nature and situated at the foot of upland areas. They comprised a small settlement with a dispersed housing pattern surrounding it. In relation to planning and conservation policy designations, the proposed wind farm site bounds an area of outstanding natural beauty (AoNB), Area of Special Scientific Interest (ASSI) and Special Protected Areas. Many of these designations overlap and the site could be viewed on this basis as being particularly sensitive to visual impact. The operational site had lesser planning designations surrounding it but at a distance of just over 3km there are Special Areas of Conservation and an ASSI.

Photo 1 shows a wind farm of a similar size and location to the one being proposed.



Map 1 shows 3km boundaries and Areas of Interest

3.0 Methodology

3.2 Research Design

This research drew inspiration from a study that was carried out in Scotland in 2003 which investigated the perception of wind farms, as well as a study from 2005 discussing perceptions of wind farms in pre and post construction phases in Scotland and Ireland.

A semi structured interview using a predesigned questionnaire (completed by the interviewers) was selected as the most effective method of ascertaining public opinion. This methodology was only made possible through the funding provided through the Challenge Fund which enabled the recruitment and deployment of a team of around 10 fieldworkers. The surveys were carried out over 3 consecutive Saturdays, beginning 18th February, 2012. A weekend was chosen in order to maximise the number of people who may be at home from 9am-5pm. Each team of two people kept a record of which houses they had visited so as to facilitate revisiting those that hadn't responded at the time of the first visit and to prevent houses already covered from being revisited. Identification and a letter of authorisation and explanation was shown to all residents during the fieldwork. Appropriate risk assessments were conducted and the PSNI were informed about the nature, time and duration of the practical work.

3.3 The Questionnaire

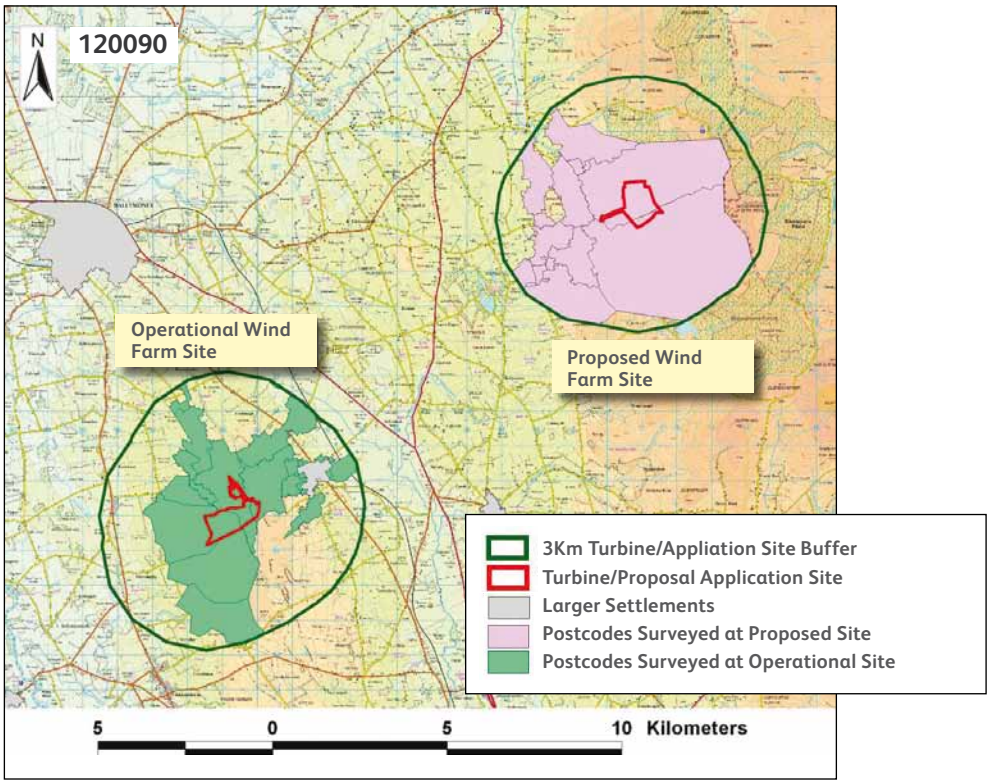
The questionnaire itself was split into two parts, with the first part being generic to both sites. An effort was made when designing the questionnaire, to avoid mentioning wind farms until as late as possible in order to prevent bias from emerging when asking people in general what they liked or disliked about their area. The second parts of the questionnaires were specific to either site and were colour coded accordingly for ease of data input. For the operational site, residents were asked about actual effects the wind farm was having on them. At the proposed site residents were asked about their potential concerns.

The initial question was factual, asking the respondents postcode, followed by attitudinal questions regarding their perception of their local area. The questions which followed were put together so that they flowed from attitudes of surroundings, to support for certain power generation techniques and on to perceptions of wind farms and wind turbines.

4.0 Results and Discussion

In total, 241 questionnaires were completed over the course of the 3 days – 131 from Site 2 (operational) and 110 from Site 1 (proposed). The approximate response rate from Site 2 was 19.9% and from Site 1, 43.8%, taking into consideration the number of properties within 3km of the wind farm or proposed site. The information from these questionnaires was inputted into 'IBM SPSS Statistics 19' to complete data analysis.

Map 2 shows the distribution of surveyed properties at postcode level



4.1 Respondents' perception of the area in which they live

With regard to the perceptions of their neighbourhoods, 98% of people from site 1 (proposed site) and 99.2% of people from site 2 (operational site) thought their area was either 'good' or 'very good' (see Table 1).

Neighbourhood perception		
Neighbourhood perception	**Site 2: Operational**	**Site 1: Proposed**
Very good	53.8%	6.2%
Good	45.4%	35.5%
Poor	0%	0.9%
No opinion	0.8%	0.9%
Total	**100%**	**100%**

Table 1

Both populations were asked to name things they liked and disliked about their area. No respondents from either area mentioned wind farms or wind turbines as something they liked. 57% of respondents in Site 2 (Operational) mentioned 'quietness' as something they liked about their area and 17% mentioned 'scenery'. 50.4% of residents in Site 1 (Proposed) mentioned 'quietness' and 18.3% mentioned scenery. No respondents from Site 1 mentioned

4.0 Results and Discussion

the proposed wind farm as something they disliked and one respondent out of 131 respondents in the Site 2 area mentioned the Site 2 Wind Farm as something they disliked. This suggests that although the Site 2 wind farm is fully installed and functional, it is not something that the general population feels excessively negative towards. This is comparable to the findings of Braunholtz 2003, who, in a larger sample, found that respondents generally liked their area, with only five spontaneously mentioning wind farms as something they disliked.

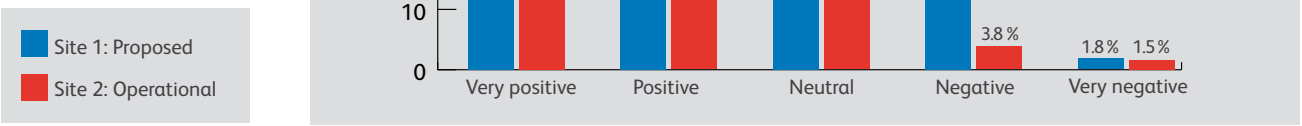
4.2 Overall Perception of Wind Farms

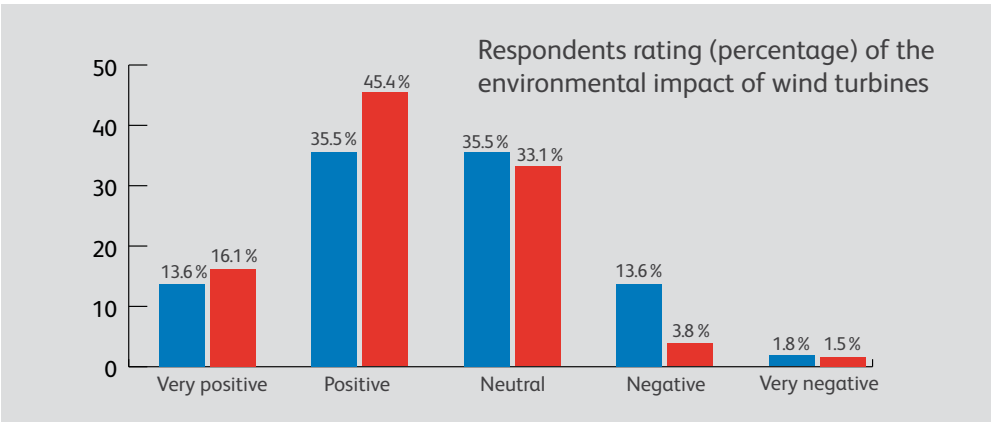
Residents at both planned and operational sites had a broadly positive view of wind turbines. At Site 2 (operational) the majority of respondents felt that wind farms were 'effective' or 'somewhat effective' at generating electricity, although one respondent from Site 2 commented that they often noticed the turbines turned off.

Table 2

Do you think wind farms are effective at generating electricity		
Opinion	**Operational Site 2%**	**Proposed Site 1%**
Yes	66.2 %	66.4 %
Somewhat	13.8 %	11.8 %
No	3.8 %	11.8 %
Unsure	16.2 %	10.0 %
Total	**100%**	**100%**

Graph 2



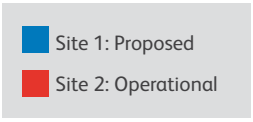


At Site 1 (proposed site) 84.6% of respondents and 94.6% of respondents at Site 2 (operational site) felt that the environmental impacts of the wind turbines were either 'very positive', 'positive' or 'neutral'. There is little difference between the opinions of either area about the environmental impacts of wind turbines. The respondents from site 2 (operational) tended to be slightly more positively inclined than those at site 1 (proposed). Similarly, more negative views were expressed at the proposed site as opposed to the operational site.

4.0 Results and Discussion

4.3 Perception of Wind Turbine Aesthetics

Graph 3



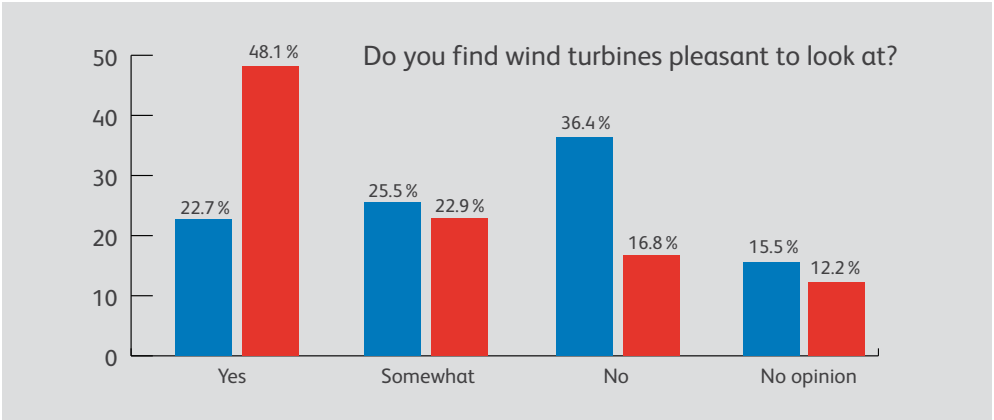


Table 3

Do you find wind turbines pleasant to look at?		
Responses	**Operational Site 2%**	**Proposed Site 1%**
Yes	48.1 %	22.7 %
Somewhat	22.9 %	25.5 %
No opinion	12.2 %	15.5 %
No	16.8 %	36.4 %
Total	**100%**	**100%**

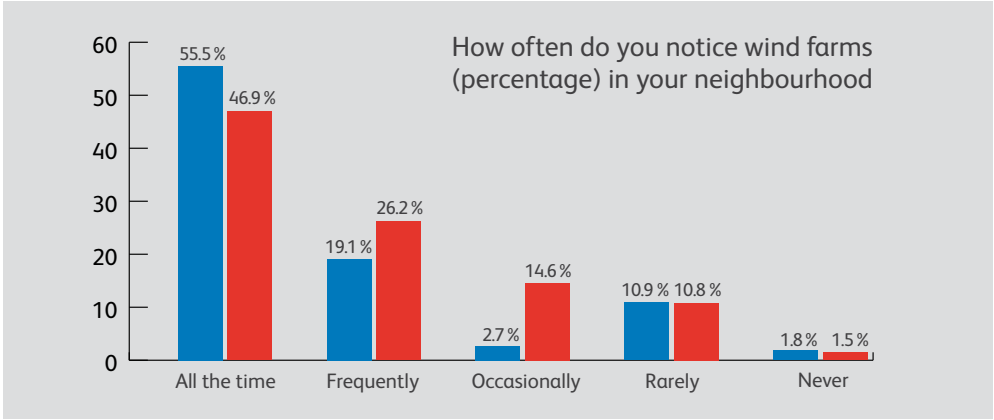
As indicated in the graph and Table 3 above, both areas had similar 'somewhat' and 'no opinion' responses when asked if they found wind turbines pleasant to look at. The differences lie in the more extreme answers where 48.1% of respondents at Site 2 (operational) did find wind turbines pleasant, compared to 22.7% in Site 1 (proposed) and 16.8% at Site 2 disliked wind turbines compared to 36.4% in Site 1. This suggests there is more of an aversion to the sight of wind turbines in the area of the proposed wind farm as opposed to the area where they are operational. Both Warren et al (2005) and Braunholtz et al (2003) found that visual impact of turbines were the cause of most concern and a major influence in the level of support of wind turbines.

In the 'other comments' section of the questionnaire, responses gained from Site 1 (proposed site) area included "They shouldn't be in residential areas", "I'm not against them, but they should be kept away from residential areas" "There's too much emphasis on wind" and "Wind power is already saturated in Ireland". Comments made in Site 2 included 'Quite a lot of people don't like it and are very angered by their increasing number'. Conversely, another respondent from this area commented that wind is 'the way forward for energy'.

4.0 Results and Discussion

4.4 How often do you Notice Wind Farms in the Neighbourhood

Graph 4



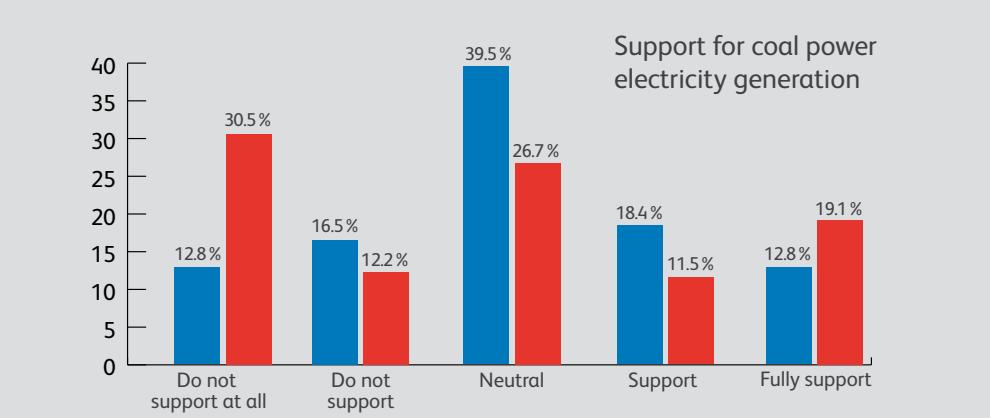
Respondents in Site 1 (proposed) generally noticed wind farms to a similar extent to those from Site 2 (operational). Having said this, 8.6% more respondents noticed wind farms 'all the time' at site 1 (proposed) as opposed to site 2 (operational). The closest operational wind farms to Site 1 (proposed area) were over 6km away from surveyed houses. This may suggest that respondents at the proposed site have become sensitised to the issue of wind farms due to the planning application.

4.5 Knowledge of Energy Security

A higher percentage of residents in Site 2 (11.5%) were aware of the term 'energy security' than Site 1 (8.2%), however, only 20% of those in Site 2 who knew of the term could provide an adequate definition as opposed to 55.6% of those who knew the term in Site 1. Hence, there was more awareness of the term 'energy security' at the operational site, but there were a higher proportion of respondents who understood the term at the proposed site. This could be due to the active perusal of the subject of energy generation in the proposed area due to an impending wind farm.

4.6 Support for methods of generating electricity

Graph 5



30.5% of respondents within Site 2 said they did not support the generation of electricity from coal at all, as compared to 12.8% within Site 1. It is also noted, however, that Site 2 also had a marginally higher percentage of respondents fully supporting this method (19.1% as opposed to 12.8%). The responses from Site 1 follow a bell curve, with the majority of respondents being neutral (39.4%).

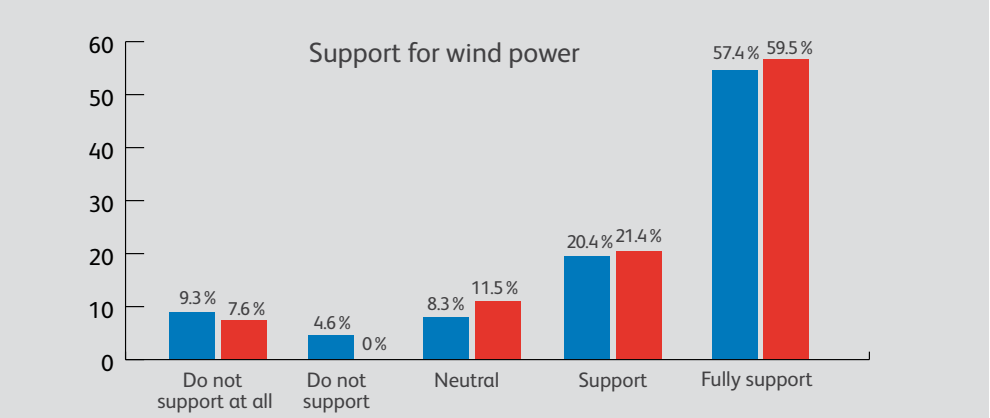
4.0 Results and Discussion

To what extent do you support coal as a method of generating electricity?		
Support for coal	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	30.5 %	12.8 %
Do not support	12.2 %	16.5 %
Neutral	26.7 %	39.5 %
Support	11.5 %	18.4 %
Fully support	19.1 %	12.8 %
Total	**100%**	**100%**

Table 4

4.7 Support for Wind Power

Graph 6



A majority, in both areas, fully supported wind power (Site 1 - 57.4%, Site 2 - 59.5%), with similar proportions of respondents from each site not supporting wind power at all (Site 1 - 9.3%, Site 2 - 7.6%). No significance was found between the area the respondent came from and their support of wind power, hence there was little difference in the responses between Site 2 and Site 1.

To what extent do you support wind power as a method of generating electricity?		
Support for Wind Power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	7.6 %	9.3 %
Do not support	0 %	4.6 %
Neutral	11.5 %	8.3 %
Support	21.4 %	20.4 %
Fully support	59.5 %	57.4 %
Total	**100%**	**100%**

Table 5

This is in keeping with the findings of Braunholtz (2003) who found that respondents were in favour of increasing the amount of power generated from wind power.

4.0 Results and Discussion

4.8 Support for other Energy Sources

In general, there was strong support for power generation by wave/tidal power, burning wood, solar power and wind power in both areas (see Tables 5, 7, 8 and 9), and less support for gas, coal and nuclear power (see Tables 4, 6 and 10). The findings were in line with Braunholtz's study (2003), which found that the majority of respondents thought the use of coal should be scaled back or stay the same. From Table 10, both populations have a vast majority who do not support the generation of power by nuclear means at all.

Table 6

To what extent do you support gass as a method of generating electricity?		
Support for gas	**Operational Site 2**	**Proposed Site 1**
Do not support at all	39.7 %	20.2 %
Do not support	17.6 %	23.9 %
Neutral	25.2 %	33.9 %
Support	7.6 %	11.9 %
Fully support	9.9 %	10.1 %
Total	**100%**	**100%**

Table 7

To what extent do you support wood (biomass) as a method of generating electricity?		
Support for biomass	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	11.5 %	12.8 %
Do not support	9.2 %	8.3 %
Neutral	20.6 %	22 %
Support	22.1 %	30.3 %
Fully support	36.6 %	26.6 %
Total	**100%**	**100%**

Table 8

To what extent do you support wave tidal power as a method of generating electricity?		
Support for wave power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	10.7 %	8.2 %
Do not support	9.9 %	2.7 %
Neutral	13.7 %	17.3 %
Support	22.1 %	20.9 %
Fully support	43.5 %	50.9 %
Total	**100%**	**100%**

Table 9

To what extent do you support solar power as a method of generating electricity?		
Support for solar power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	10.7 %	8.2 %
Do not support	3.8 %	1.8 %
Neutral	9.9 %	9.1 %
Support	30.5 %	20.9 %
Fully support	45 %	60 %
Total	**100%**	**100%**

4.0 Results and Discussion

To what extent do you support nuclear power as a method of generating electricity?		
Support for nuclear power	**Operational Site 2%**	**Proposed Site 1%**
Do not support at all	69.5 %	70 %
Do not support	11.5 %	12.7 %
Neutral	9.9 %	12.7 %
Support	5.3 %	2.7 %
Fully support	3.8 %	1.8 %
Total	**100%**	**100%**

Table 10

4.9 Concerns and Opinions at the Proposed Wind Farm site (site 1)

The respondents from Site 1 (Proposed) were asked how they would rate their area after the wind farm was constructed. It can be seen that the number of residents rating the area 'very good' fell from 62.7% to 43.6%. 'Good', 'Poor' and 'Very poor' ratings increased, with 'Very poor' ratings rising from 'none' to 4.5%.

Although the respondents from Site 1 were generally positive towards wind farms and wind power generation, a substantial proportion of people thought that their area would be less satisfactory to live in due to the proposed wind farm, which is suggestive of a NIMBY attitude. This is consistent with the work of Warren et al (2005), who found that NIMBY-ism was more pronounced in proposed wind farm areas as opposed to operational wind farm areas.

Expected area rating after wind farm construction at Site 1 (proposed)		
Perception	**Current area rating**	**Expected area rating after windfarm construction**
Very good	62.7 %	43.6 %
Good	35.5 %	42.7 %
Poor	0.9 %	6.4 %
Very poor		4.5 %
No opinion	0.9 %	
Total	**100%**	**100%**

Table 11

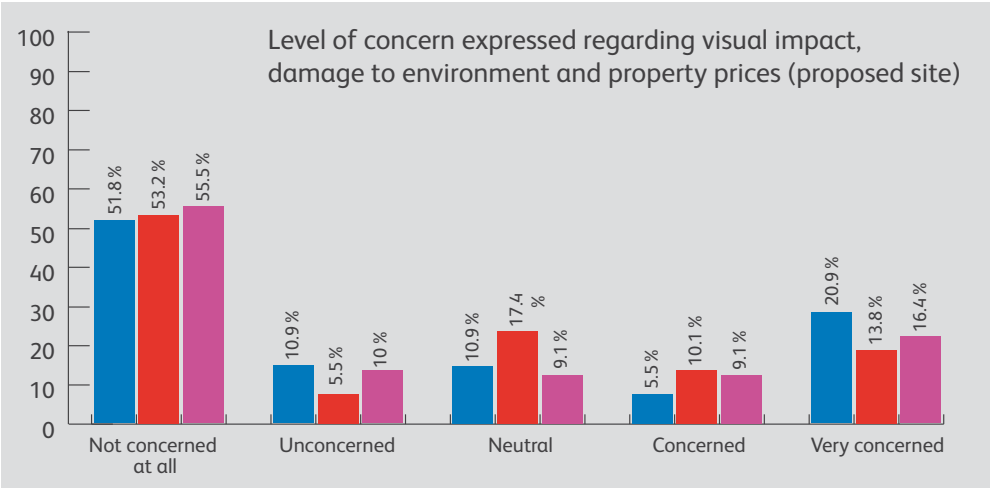
4.10 Residents Concerns at the Proposed Wind Farm Site

The respondents in Site 1 (proposed site) were asked to rate their concern about a number of issues related to wind farms on a scale of 1 to 5. 70.9% of respondents were not concerned at all about noise during construction. 60.9% were not concerned at all about Radio or TV signal interference. 67.3% were not concerned at all about shadow flicker effect.

The main areas of concern of the respondents at the proposed site in Site 1 were:
- Damage to the Environment (13.% very concerned)
- House or Land Prices (16.4% very concerned)
- Visual Impact (20.9% very concerned).

4.0 Results and Discussion

Graph 7



Over 50% of respondents in these cases were 'not concerned at all', although 20.9% were 'very concerned' about visual impact, 16.4% about house or land prices and 13.8% about damage to the environment. 'Not concerned at all' and 'very concerned' were the top two chosen answers with both house/land prices and visual impact. This suggests a presence of strong opinion in the community about these issues, where the opinion is polarised. This is, again, consistent with findings from both Braunholtz et al 2003 and Warren et al 2005, who found that the visual impacts of wind turbines are major factors for concern and levels of support.

Very few respondents believed the area would benefit from tourism as a result of the wind farm. 31.8% thought there may be extra employment, with some respondents citing work for the local quarry as a possibility. Many added in the comments that while they thought the local community should benefit from employment, they didn't think it actually would.

Although almost 25% of respondents thought that the community would benefit from a community fund, this topic resulted in many comments being made. Some respondents thought that "the community fund is a sop" and that it was not enough, or may not be divided equally enough. It was suggested by some that a community fund should be there for the life of the wind farm, with another suggesting that there should be yearly compensation for those houses most in sight of the wind farm.

Comments were often directed towards the wind company and land owners, suggesting that these were the only people to see any real benefit. 45.5% of respondents, when asked if there were any ways they thought their community should benefit, thought that the local area should receive cheaper electricity. Those who expanded on this comment often gave the reason that they should get cheaper electricity as they were the ones who would be impacted by the effects of the wind farm.

One respondent mentioned that local schools should benefit from cheaper electricity, with another expressing the view that the wind farm should be used to teach school children about renewable energy. Other comments made included 'if they wanted the community to benefit then there should have been more involvement' and the suggestion of a community turbine within the wind farm owned by and supplying the community.

4.0 Results and Discussion

42.7% of respondents from Site 1 were aware of media articles about the wind farm, compared to 34.5% who were aware of the consultation, which just under half of whom attended. 9.1% spontaneously mentioned they had gained information from a local opposition group. It seems that most respondents were aware of media articles, as opposed to gaining information from the wind farm company or public consultation, which is comparable to the findings of Braunholtz et al 2003, that the local newspaper was where residents gained most information.

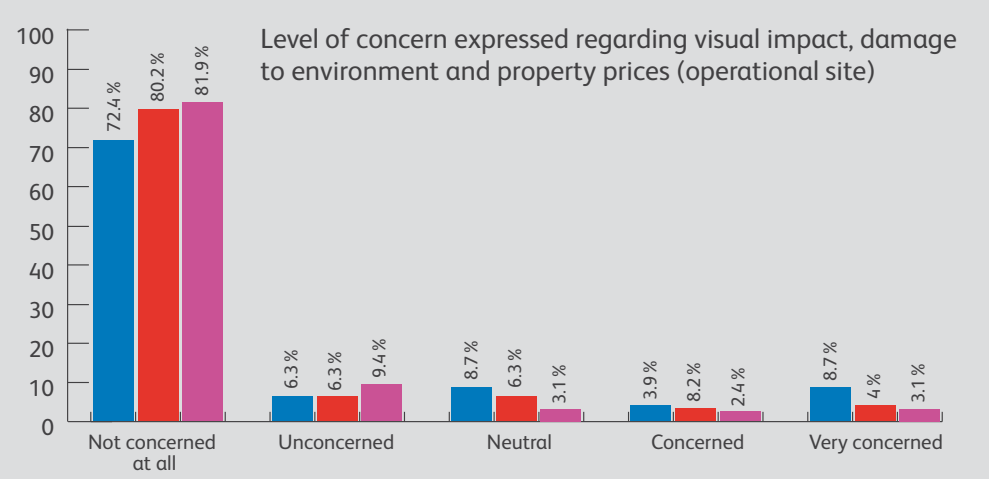
43.8% of those who attended the consultation felt they had not been given enough information, reasons for which included 'they avoided answering questions' and 'the picture mock ups didn't look representative'. Other comments made included 'the public isn't informed, there's no information' 'the wind company needs to be more open and honest' and 'there should be more discussion'.

4.11 Resident's Concerns, Effects and Opinions at the Operational Wind Farm Site

Table 12, below, shows the answers given when the respondents in Site 2 were asked to rate what they thought their area was like before the Site 2 wind farm was installed, compared to their rating of the area now. There was little change in the data, with 53.8% rating the area as 'very good' as it is, with the wind farm, and 53.5% as 'very good' before the wind farm was installed. 45.4% rated the area as 'good' as it is, with the wind farm, and 42.5% as 'good' before the wind farm was installed. The installation of the wind farm has had little difference in what they remember their area to be like prior to installation.

Area rating before wind farm was installed at Site 2 (operational)		
Perception	**Current area rating**	**Area rating before wind farm construction**
Very good	53.8 %	53.5 %
Good	45.4 %	42.5 %
No opinion	0.8 %	4.0 %
Total	**100%**	**100%**

Table 12

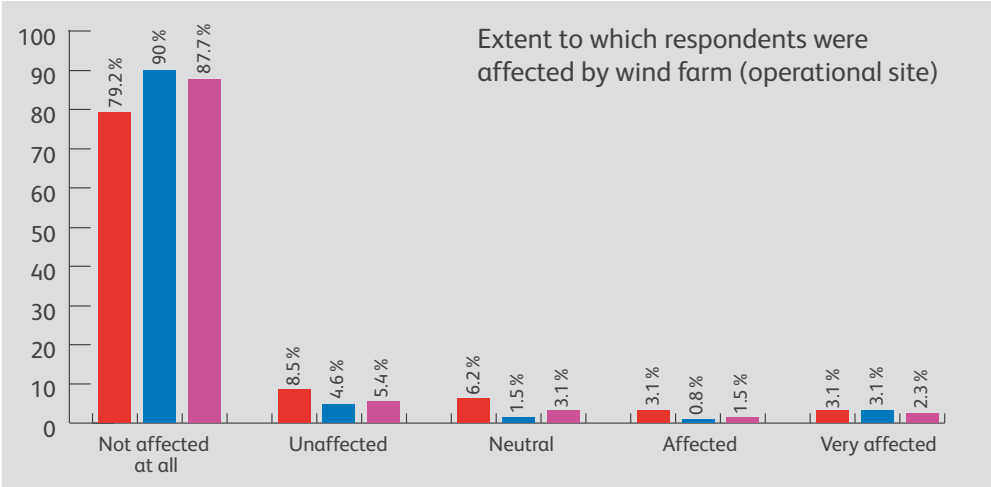


Graph 8

4.0 Results and Discussion

Findings indicate that 78.2% (averaged across these three issues of concern) of respondents reported not being concerned at all about visual impact, environmental damage or effects on property prices prior to the development of the operational wind farm.

Graph 9



When asked how the development of the wind farm had actually affected them, 85.6% of respondents reported that the operational wind farm had not affected them at all (averaged across the three main issues of concern). This indicates that the levels of concern dropped post development of the wind farm site.

10.3% of respondents could remember being concerned about noise from the turbines prior to construction with only 2.3% being affected. Less than 2% were affected by noise during construction. A total of 6.2% say they have been affected or very affected by the visual impact of the turbines, less than 2% stated that they have been affected by flicker effect, 3.8% have been affected by effects on property prices and 6.9% say they have been affected by signal interference. 3.9% felt there had been damage to the environment Two of the respondents at site 2 who reported environmental damage said they had no access to the moss/bog and hence were not allowed to cut peat on the mountain anymore.

The most common issues to be 'affected' or 'very affected' by were signal interference and visual impact, although these levels were still low. This supports Braunholtz, 2003, in that his study found that the highest proportion of people who said there had been problems, listed 'the look of the landscape being spoiled' most often. The findings are also supported by both Braunholtz et al 2003 and Warren et al 2005, in that residents' concerns have not been realised.

Very few respondents in Site 2 (operational) can remember receiving any information prior to the wind farm's construction. 16.4% of respondents reported that they received information by word of mouth. 9.4% remembered being aware of media articles, 6.3% were aware of the public consultation with only 1 respondent having attended. 0.8% of respondents remember receiving information from the wind company. Via the comments, some people said they only found out about the wind farm when construction began. In comparison, those in Site 1 (proposed site), are much more aware of the media articles and

4.0 Results and Discussion

public consultation with regards to the Site 1 wind farm. Braunholtz et al, 2003, also found that the majority of respondents couldn't recall being consulted.

Employment was the biggest perceived benefit at site 2 (Operational), with 13% of people answering 'yes' when asked if they thought there had been any benefit to the local community. There had been no community fund provided for this wind farm, however 1.5% of respondents from this site thought there had been a benefit from a fund. Had a fund been provided to the community, this percentage may have been higher. Perhaps funding from another source had been made available to the community and had been assumed to have been associated with the wind farm. 6.9% agreed there had been benefits from tourism but believed this could be increased by opening up walking routes and encouraging the tourist aspect of the wind farm. Only 3.1% of respondents thought the community had benefitted from better roads. 35.9% of respondents spontaneously mentioned that cheaper electricity for their local area should be a benefit as a result of having a near-by wind farm. As with the proposed wind farm site, many comments were of the opinion that only the land owners and wind company actually benefitted.

5.0 Conclusion

The role of renewable power generation in providing energy security, resilience and diversity, together with its potential benefits to the economy have been recognised and prioritised by the Northern Ireland Executive. Investigating and assessing the opinion and perception of those who reside close to wind turbines is therefore vital so that so that their impact on local communities and neighbourhoods is understood.

Overall it was found that the presence of wind turbines had relatively little impact on resident's perception of their neighbourhood. Residents at both sites were broadly satisfied with the area in which they lived in, with a vast majority either rating their area as 'good' or 'very good'. (99.2% for the operational site and 98.2% for the proposed site).

5.1 Impact of Wind Farms on Neighbourhood

At the operational site (site 2), respondents within 3km of the wind farm reported in an average of 85.6% of cases across the three criteria (visual impact, damage to the environment and negative impact on property prices) that they were not affected at all by the wind farm. On the basis of these figures it can therefore be concluded that again, in a large majority of cases, residents can broadly expect to be unaffected by the presence of neighbouring wind farms.

Statistical significance was found in that those who were most concerned about visual impact, were also likely to think wind farms were ineffective and have negative environmental impacts.

5.2 Respondents view of Wind Power Generation

This study found that respondents from both operational and proposed sites were generally strongly in favour of energy generation by renewable techniques, including wind power. At the operational site 81%, either support or strongly support wind power while at the proposed site this figure was 78%.

The majority of respondents from both areas also considered wind turbines to be an effective method of generating electricity as well as having positive or neutral environmental impacts.



5.0 Conclusion

5.3 Aesthetics of Wind Farms

Respondents from the operational site in Site 2 were more likely to find wind turbines pleasant to look at compared to those at the proposed site in Site 1. This suggests there was more acceptance, possibly through the experience of living adjacent to them, of the visual impact of the turbines at the operational site than at the proposed site, even though there were similar levels of perceived exposure to wind farms.

5.4 Methods of receiving information

The largest proportion of information gained at site 1 (proposed) appears to come from media articles. Similar proportions of people reported receiving information from the opposition group campaigning against the wind farm as had received information from the wind farm company. 43.8% of those who had attended the consultation did not feel they had been given enough information. The comments made concerning the way in which they received information, coupled with the number disappointed by the public consultation, suggest that some of the community are dissatisfied with the stakeholder engagement process that was undertaken.

Few residents at Site 2 (operational) can remember any media articles or consultation about the wind farm at all.

5.5 Perceived Benefits from Wind Farms

The biggest benefits the community at the proposed site in Site 1 (proposed) expected to see were from employment and the community fund. Employment was the biggest perceived benefit at site 2 (operational), with some respondents calling for more access and walking routes around the wind farm. A substantial number of respondents at both sites mentioned that cheaper electricity for the local community should be a benefit. In relation to this the development of community wind turbines similar to schemes run in Wales would directly benefit the host communities. The schemes are based on community members taking shares in an Industrial and Provident Society. Members then benefit from dividends from the sale of the electricity with net income returned to the community via dividend payments over the operational lifetime of the turbine.

In summary, there is positive public perception of renewable energies, including wind power. Those at the proposed site in Site 1 are concerned about the visual impact of the proposed wind farm and are less likely to find wind turbines pleasant to look at than those at the operational site in Site 2.

A substantial proportion of both populations think there should be some tangible benefits in terms of cheaper electricity and local employment opportunities. The community at the operational site in Site 2 also suggested more consideration may be needed regarding the tourism potential of the wind farm

6.0 Recommendations

1. Communication with the host community is viewed as an important component in the development of wind farm projects. The community at the proposed site would have preferred more information and more open dialogue with the wind company. Wind farm developers should be encouraged to build a rapport and develop relationships with local host communities (see recommendation 4).

2. Building up a collection of 'before and after' studies of populations where a proposed wind farm has been installed, and making these publicly available, may help to allay concerns amongst communities and demonstrate that, often, their concerns are not realised. In this particular case study at the time of drafting of this report the proposed wind farm has just been recommended for planning approval. It is suggested that follow up research should be undertaken at an appropriate juncture post construction and commissioning to assess if attitudes to the development have changed.

3. The issue of securing tangible benefits for the local community needs to be addressed. Very few respondents from the operational site (Site 2) feel there has been much benefit at all to the community as a whole. In relation to this, the creation of "community turbines" should be investigated, where the host community benefits from wind energy installations and local people can exercise a degree of control over the projects.

4. In order to ease concerns about wind farm projects it is recommended that neighbouring communities, should receive, be informed of and witness positive contributions above and beyond payments to individual land-owners. There should also be more comprehensive stakeholder engagement between the energy companies and local communities.
The implementation of these recommendations may go some way towards assisting with the attainment of the ambitious 40% renewable energy target set out by the Strategic Energy Framework for Northern Ireland, whilst at the same time, alleviating negative views and perceptions of communities about the potential impacts on their neighbourhoods.



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